heavier; the top of the skull is much flattened, especially over the fronto-parietal constriction, where it is also somewhat depressed.

The two small unicuspid teeth are subequal in size, the hindermost only being slightly larger in cross-section. Though the label records that this shrew was "found dead," there can be little doubt that its demise had not long taken place, for the skin is in perfect preservation throughout and reflects great credit on the collector, the fur being like shining velvet.

LXI.—*Notes on some Type Specimens of Cretaceous Fishes from Mount Lebanon in the Geneva Museum.* By A. Smith Woodward, F.L.S.

When Professor F. J. Pictet, in collaboration with Mons. A. Humbert, published an extended and revised memoir on the Cretaceous fish-fauna of Mount Lebanon in 1866 *, he was still unable to elucidate further some of the more problematical fishes which he had already described in his original memoir on the subject in 1850 †. The much later researches of Davis ‡, based upon the Lewis Collection, also failed to contribute many facts of importance to our knowledge of these doubtful forms, and did not refer to Pictet's type specimens in the Natural History Museum of Geneva. During a recent study of the Cretaceous fish-fauna in question, I have therefore visited Geneva for the purpose of examining Pictet's original collection; and, thanks to the kindness of Dr. Maurice Bedot and Dr. Weber, I am now able to add a few interesting facts concerning some of the imperfectly understood types, regarded in the light of our present knowledge.

1. *Petalopteryx syriacus*, Pictet, *op. cit.* p. 22, pl. iii. fig. 1.

The unique type specimen of this species is very inadequately described and imperfectly figured by Pictet. The fish is displayed chiefly in side view on a small slab of fissile limestone from Hakel, but the trunk and dorsal fin are for the most part indicated only in impression. The hinder part of the cranial roof is well preserved and suggestive of that of *Amia*, with large parietal bones in contact mesially, and a

* Pictet & Humbert, 'Nouvelles Recherches sur les Poissons Fossiles du Mont Liban' (Geneva, 1866).

† F. J. Pictet, 'Description de quelques Poissons Fossiles du Mont Liban' (Geneva, 1850).

‡ J. W. Davis, "The Fossil Fishes of the Chalk of Mount Lebanon in Syria," Trans. Roy. Dublin Soc. [2] vol. iii. (1887), pp. 457–636, pls. xiv.–xxxviii.

single pair of transversely elongated supratemporals. These elements are ornamented with rugæ and tubercles of enamel, as in *Lophiostomus* from the English Chalk. One fragment of jaw, possibly maxilla, bears traces of small, slender, conical teeth; while among other remains in the region of the mouth there are also scattered numerous small blunt teeth, some distinctly cupped at the apex. Below the head there are a few very slender branchiostegal rays. The internal skeleton of the trunk is not observable, and the fins are not remarkably well preserved. The pectoral fins comprise each at least 15 stout rays, and seem to have been as large as represented by Pictet; but no fulcra can be distinguished on their anterior border. The pelvic fins, each with 8 or 9 stout rays, are fringed with fulcra, which rapidly decrease in size distally. The dorsal fin is observed to be much elevated in front, without fulcra; but it is imperfectly preserved, and the number of its rays is uncertain. There is no trace of an anal fin. The caudal fin seems to have been forked, and its upper lobe is fringed with large fulcra, which are erroneously represented as a bifurcating bundle in Pictet's figure. Fulcra seem to have been absent on the lower lobe of the tail. The squamation, so far as distinguishable, is regular. The few scales preserved exhibit a smooth enamelled external face, while those near the dorsal and ventral borders of the fish are clearly much narrowed.

It thus seems probable that *Petalopteryx* is an Amioid ganoid of the family Macrosemiidæ, as already maintained in the British Museum 'Catalogue of Fossil Fishes' (part iii. 1895, p. 181). Among new points to be added to the generic diagnosis may be mentioned the presence of stout crushing-teeth within the mouth and of well-developed fulcra on the pelvic fins. It now remains to discover new specimens of *Aphanepygus* from the Cretaceous of Dalmatia, a genus referred to the "Macrosemii" by Bassani *; for it seems likely that the features in which this fish appears to differ generically from *Petalopteryx* will prove to be merely imperfections in the unique type specimen.

2. *Coccodus armatus*, Pictet, *op. cit.* p. 51, pl. ix. fig. 9.

Though the Pycnodont genus *Coccodus* is now tolerably well known from descriptions by Davis † and the present writer ‡, the original figure by Pictet has always been difficult to understand. An examination of the type specimen,

* F. Bassani, "Descrizione dei Pesci Fossili di Lesina," Denkschr. k. Akad. Wiss., math.-naturw. Cl. vol. xlv. (1882), p. 197, pl. i. figs. 1–9.

† J. W. Davis, *loc. cit.* p. 546, pl. xxx. fig. 1; also Quart. Journ. Geol. Soc. vol. xlvi. (1890), p. 565, pl. xxii.

‡ Catal. Foss. Fishes Brit. Mus. pt. iii. (1895), p. 266, pl. xvi. fig. 4.

however, in the light of present knowledge, readily explains it. The upper part of the figure represents the two splenial bones crushed together and exposed from their oral face. Two of the longitudinal series of teeth are shown on each element, and these together constitute the so-called four rows of palatal teeth of Pictet and Davis. To the left, and mostly below the splenials, the imperfect cranium is displayed in right side view, its snout pointing upwards. The mesethmoid and vomer are distinguishable, and on the edge of the latter is exposed one of the lateral series of small teeth, which is described by Pictet and Davis as pertaining to the mandible. The cranial roof-bones are shown to be ornamented with tubercles, and the top of the brain-case bears the characteristic, laterally-compressed, forwardly-directed spine. There is also a prominent ornamented angle at the occiput. The pectoral arch is vertically crushed, but obscured by the skull on the left side. On the right the anteriorly-directed spine of the clavicle is distinct, while on the left it seems possible to recognize parts of the two posteriorly-directed spines of the same element. Although Pictet mentions "vertebræ deformed by fossilization," there are no traces of vertebral centra in the anterior part of the abdominal region preserved; but the neural spines are shown to be fused with their somewhat expanded arches. There are no indications of scales or scutes.

3. *Osmeroides megapterus*, Pictet, *op. cit.* p. 27, pl. iii. fig. 3.

This species is founded on a specimen much too imperfect for precise determination and not exhibiting even so important a feature as the mouth. The suboperculum is rather large, and beneath it there are remains of seven branchiostegal rays, all comparatively slender, none laminar in form. The vertebral column is still more bent and broken than indicated in the figure, so that the abdominal region is much distorted and the number of vertebræ cannot be determined. There seem to be about 20 or 22 caudal vertebræ. As observed by Pictet, there are no traces of the pectoral fins; but the pelvic fins are relatively large, each comprising at least six stout rays, all of which are articulated and divided distally. The very slender pelvic fin-supports are seen in front, though not shown in the figure. The dorsal fin is situated rather far forwards, and seems to consist of 10 or 12 rays. The foremost ray preserved is probably short and spinous, but all the others are divided distally and with distant articulations. The fin-supports are very stout and dagger-shaped. The remains of the comparatively small anal fin comprise only 6 or 7 rays, which are similarly divided and articulated. The large scales are thick, smooth, and shining.

From this description it is evident that *O. megapterus* does not belong to the same genus as the typical *Osmeroides lewesiensis* from the English Chalk. So far as the parts preserved admit of judgment, indeed, the fish must be referred to the Scopeloid genus *Sardinioides* of W. von der Marck *.

4. *Clupea laticauda*, Pictet, *op. cit.* p. 39, pl. vii. fig. 3.

It is doubtful whether any of the supposed species of *Clupea* from the Cretaceous of Mount Lebanon are correctly referred to this genus; but there are none more readily separated from it than the so-called *Clupea laticauda*, of which the type specimen still remains the sole known example. This small fish is very unsatisfactorily figured by Pictet; but, on account of the absence of jaws, its precise affinities cannot be determined even by renewed examination in the light of present knowledge. In the cranium the frontal bones are partly preserved, and an impression of the outer face of their hinder portion seems to exhibit a lateral ornamentation in the form of tuberculated radiating lines. The parasphenoid is straight and comparatively thick; but the jaws are quite unrecognizable. The vertebræ appear to have been nearly 50 in number, half of them caudal; and the centra, which show fine longitudinal striations, are shorter than deep. One caudal vertebra seems to exhibit a lateral keel. The ribs are somewhat expanded proximally, and do not completely encircle the abdominal cavity. The pectoral fins are very delicate, crushed, and displaced. The pelvic fins comprise much stouter rays (probably 9 or 10) with robust supports, and are inserted far forwards. The dorsal fin exhibits 19, the anal fin 13 supports. There are slightly sinuous fulcral rays above and below at the base of the caudal fin, which is incomplete distally. There are no ridge-scales of any kind, and the squamation must have been either very delicate or absent. An impression of coprolitic matter, filling a comparatively slender intestine, occurs along the greater part of the abdominal region.

This fish probably belongs to the same family as *Enchodus* and *Pomognathus*. In many respects it is very suggestive of the latter genus; but it is distinguished among other features by its more numerous vertebræ.

5. *Pagellus libanicus*, Pictet, *op. cit.* p. 11, pl. i. figs. 2, 3.

The Acanthopterygians of the Cretaceous period are still very imperfectly known, and few are assigned to their correct systematic position. While, therefore, not attempting to express an opinion on the affinities of the two species

* Palæontogr. vol. xi. (1863), p. 45.

originally described by Pictet, but not subsequently noticed, it may be of interest to add a few notes which will be of service in eventually determining their true relationships.

Pagellus libanicus is represented by two specimens which seem to be correctly placed in one and the same species. The first (Pictet's fig. 2) exhibits about 24 vertebræ, of which half are abdominal and half caudal. The hinder abdominal vertebræ are shown to bear very strong downwardly-directed transverse processes. The clavicle bears a considerable laminar expansion, and there is also a long and slender post-clavicle. The pectoral fins seem to have been laterally placed, with the pelvic pair directly beneath them. The pelvic fin-rays cannot be counted. The dorsal fin comprises three small spines, gradually increasing in length, followed by 13 or 14 slender articulated and bifurcating rays. It is uncertain whether there are more than two short spines in front of the anal fin, which shows 10 or 12 soft rays. The second specimen (Pictet's fig. 3) confirms the characters of the vertebral column and dorsal fin already noted. Neither fossil exhibits satisfactory remains of the head and scales.

6. *Pycnosterinx dorsalis*, Pictet, *op. cit.* p. 17, pl. ii. fig. 3.

The description of the fossil thus named can be readily verified, so far as it extends. The articulations of the dorsal and anal fin-rays are rather distant, as in the so-called *Pagellus*. The dorsal fin seems to have comprised three gradually lengthening spines, though only the hinder two are clearly shown in the fossil; and these are much shorter than the 8 or 9 soft rays which follow and give the fin an acuminate form. The anal fin exhibits three spines similarly lengthening, but considerably stouter than those of the dorsal; and these are followed by about 6 soft rays.

BIBLIOGRAPHICAL NOTICE.

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The object of this little compilation is a good one and the plan of it is methodical; but, unfortunately, like most works of a similar class, it asserts more than can be proved in some cases, and some things which can be disproved in others. The authoress also appears not to have had access to a very extensive library, whilst some of the books freely quoted from are themselves compilations, and very few (with the exception of Lydekker's Natural History and one or two works by Miss Ormerod, Mr. O. V. Aplin, and the Rev. Theodore Wood) can be regarded as recent.